Heney Lake Fondation
Information Bulletin
June 2005

In our October 2004 *Bulletin*, plans were described for a number of activities aimed at a) confirming that the continuing high phosphorus levels in Lake Heney are due to a lack of iron in the top layers of the sediment and b) conducting some pilot experiments that would lead to a way of correcting the problem. This *Bulletin* provides an update on these activities, as well as a summary of the results of the analyses of water and sediment samples taken from the lake in 2004.

See Appendix for a recap of the chemistry as we currently understand it.

As planned, a plastic curtain was installed across the mouth of *la Petite Baie des Prêtres* at the north end of the lake – for which we thank *les Pères Monfortin* for their permission – and pairs of floating enclosures were anchored in *Baie de la Mine* and *Baie Bertrand*. Meteorological data was obtained from a floating station anchored in the lake and currents measured by two methods in order to obtain a sense of how quickly and thoroughly any chemicals added to the lake would mix and disperse throughout the lake.

Lake samples were tested under the supervision of the Quebec MENV to ensure the safety of the experiments proposed for *la Petite Baie* and the enclosures.

In mid-November, Dr. Richard Carignan and his team treated *la Petite Baie* in one day by introducing iron chloride into the propeller vortex of their boat. While this treatment did cause a drop in total dissolved phosphorus, the iron complexes formed remained suspended longer than anticipated. This could prove to be useful to us when treating the whole lake as the longer settling time would lead to better mixing. Sampling through the ice in January 2005 indicated that, as anticipated, phosphorus levels were substantially lower inside the bay as compared to the lake as a whole. Furthermore, there was no evidence of toxicity to fish. Further observations will be made to confirm this and to check on the impact of the treatment on other organisms in the bay.

Unfortunately for the enclosure experiments in the deeper parts of the lake, preliminary tests indicated some leakage out of the enclosures, probably due to excessive motion on an uneven bottom that led to tears and holes. With an unacceptable exchange between the inside and outside of the enclosures, the experiments planned could not be undertaken before freeze-up.

A problem was encountered during the spring break-up when the strap holding the curtain broke (or was cut) and the curtain badly torn. While we have the most important data from the experiment, we will not be able to continue to monitor the differences between the bay and the lake as long as we had hoped.

The results of the 2004 monitoring program by Dr. Yves Prairie indicated that the lake is not showing signs of recovery on its own. The average phosphorus level for the year was almost 23 micrograms per litre, which is a small increase over the 2003 levels. Seasonal variability followed the usual pattern with high concentrations at spring turnover (28 micrograms per litre) followed by a rapid decline and then a gradual increase from mid-July onwards. Water transparency was comparable to recent years but not as good as a decade ago, with a significant decline throughout the course of the season, from 3.8 metres in early July to less than 2 metres in early September.

Temperature profiles showed the expected changes with the thermocline (below which the temperature does not increase and little mixing takes place) occurring at around 14 metres. Oxygen profiles indicated that the deepest layers (where the oxygen is used up during the decomposition of organic matter) became anoxic (lacking in oxygen) in late July. By early September most of the water below the thermocline was anoxic. However, phosphorus profiles showed higher levels of phosphorus in the deepest parts of the lake beginning in June, i.e. before these layers became anoxic, which is not the typical pattern for lakes such as ours. Iron levels in the water at these lower depths were quite low in comparison to other Quebec lakes and showed a small but significant accumulation over the summer.

The long awaited results of the analyses of sediment cores were particularly informative. Dr. Prairie found that Lake Heney's iron to phosphorus ratio was higher than in three other lakes in the area some ten years ago but is now lower. Furthermore, *"this recent decline is not due to a decrease in iron but rather a substantial increase in phosphorus, consistent with the excessive loading of nutrient rich material during the fish farm years."* (*Yves Prairie, February 2005*) (More information on this is available upon request.)

Our plans for summer 2005 include:

- continued sampling and monitoring
- investigation of methods for the large-scale treatment of lakes
- an independent review of the monitoring program, the conclusions drawn and the treatment plan

The Directors of the Association are meeting regularly, as is the *Comité paritaire*, the technical committee of the *Fondation du Lac Heney* responsible for technical studies and rehabilitation activities.

Meanwhile, all residents on or near Lake Heney and its neighbouring lakes are asked to be vigilant in keeping external phosphorus additions to the lake to a minimum. This includes:

- using phosphorus-free cleaning products
- maintaining a vegetative border at the shoreline
- not using lawn fertilizers
- regular emptying and inspection of septic systems
- cut only dead trees within 100 metres of the lake or surrounding streams
- contact the municipality about current regulations with respect to other tree cutting

Future Bulletins

You can receive future Bulletins electronically. Please contact Allison Craig by e-mail at *ajcraig@magma.ca* with "Lake Heney mailing list" in the subject line.

Who to contact for further information?

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Graeme Kirby, Association President (819-467-3435; kvdyadic@allstream.net) or any Director of the Association.

APPENDIX

Context

Since the closure of the fish farm in 1999, ongoing monitoring by Professor Yves Prairie has shown that the lake has not recovered in the manner anticipated and that phosphorus levels have remained above 20 micrograms per litre. The level targeted in our settlement with the Quebec government is 15 micrograms, i.e. the level estimated prior to the operation of the fish farm.

Why is this important?

Phosphorus is a key nutrient in the growth of aquatic plants and algae. While some algal growth is normal during the summer months, higher levels of phosphorus lead to increased growth that, in turn, leads to poor water quality, turbidity and unpleasant amounts of organic matter floating in and on the water. This process can become an ever-increasing spiral as the lake becomes eutrophic, or overly rich in nutrients; hence the need to reduce the phosphorus to levels that can be maintained by the lake.

Other lakes have experienced similar problems with algal growth but have recovered after external sources of phosphorus have been reduced. Why hasn't this worked with Lake Heney?

While the reasons for the lack of recovery by Lake Heney have not yet been established for certain, our scientists believe that the underlying cause is due to a low level of iron in the sediment layers of Lake Heney. Professor Prairie found these iron levels to be amongst the lowest in over 30 lakes in Quebec. In the normal life cycle of the lake, organic material such as aquatic plants and algae, which contain phosphorus sink to the bottom when they die. There they decompose through the action of sediment bacteria and fungi which use this organic material for metabolic energy. During this decomposition, phosphorus is released but can react with substances such as iron oxide (as well as aluminum or manganese) and remain in the sediment rather than being returned to the lake to support additional algal growth. It would appear that the huge excess of phosphorus from the fish farm overwhelmed the existing levels of iron and now, several years after its closure, the sediment is not capturing and retaining the phosphorus as it would normally.

Would oxygenation help?
Under these circumstances, it is the belief of our scientists that oxygenating the lake would actually make the problem worse as it would speed up decomposition of the organic material and lead to increased phosphorus release rather than the opposite.